# PROGRESS REPORT No. 5
# ON
# SKID RESISTANCE STUDY
# U.S. 31 TEST ROAD

SEPT., 1956
No. 36

by

JOHN W. SHUPE

Joint Highway Research Project

PURDUE UNIVERSITY
LAFAYETTE INDIANA

[illegible]

[illegible]

ST[illegible] M[illegible]

TO: [illegible]
Joint [illegible] [illegible] 1965

FROM: H. L. Mi[illegible] [illegible] 15-1
[illegible]

Attached is [illegible] the
[illegible] Assistance [illegible] axles.
The semi-annual [illegible] 31
Test Road. The [illegible] groups

This sixth [illegible] comparatively
poor skidding [illegible] traffic. The
rigid pavement [illegible] than the
flexible [illegible]

This report [illegible] Committee
for their [illegible]

[illegible]

[illegible]
[illegible], Assistant Director
[illegible] Project

HLM:hb

cc: D. S. [illegible]
J. R. [illegible]
J. [illegible]
F. [illegible]
G. A. [illegible]
G. A. [illegible]
R. E. [illegible]
R. H. Petty
Lloyd Poindexter
C. E. Vogelgesang
J. L. Waling

SKID [illegible]

One of [illegible] cement concrete and the bituminous [illegible] Test Road near Columbus, Indiana [illegible] Test [illegible] Committee Memorandum No. 5 establi[illegible] as to measure the relative skid resi[illegible] two [illegible] pavemen[illegible] and to measure the changes in skid [illegible] under traffic."

In conf[illegible] discussions of the Joint Highway Research Project Advisory Board [illegible] January 27, 1956, the Joint Highway Research Project, in cooperation with the State Highway Department of Indiana has conducted and will [illegible] conduct periodic skid tests on the Test Road In this report are the results of the series of tests made in August, 1956 and a discussion of the [illegible] trends to date

The 7.141 miles of flexible or bituminous concrete test pavement (detailed on Figure 1 as sections F-1, F-2, and F-3) and the 6.939 miles of rigid or portland cement concrete test pavement detailed on Figure 1 as sections R-1, R-2, R-3, R-4, and R-5 are the subject of this study All tests made on these test sections were performed so as to compare the skid resistance characteristics of the flexible and rigid test pavements Studies of the skid characteristics have been made since shortly after the sections were opened to traffic and tests will be conducted periodically as long as the Test Road Committee requires them

Digitized by the Internet Archive
in 2011 with funding from
LYRASIS members and Sloan Foundation; Indiana Department of Transportation

http://www.archive.org/details/progressreportno00shup

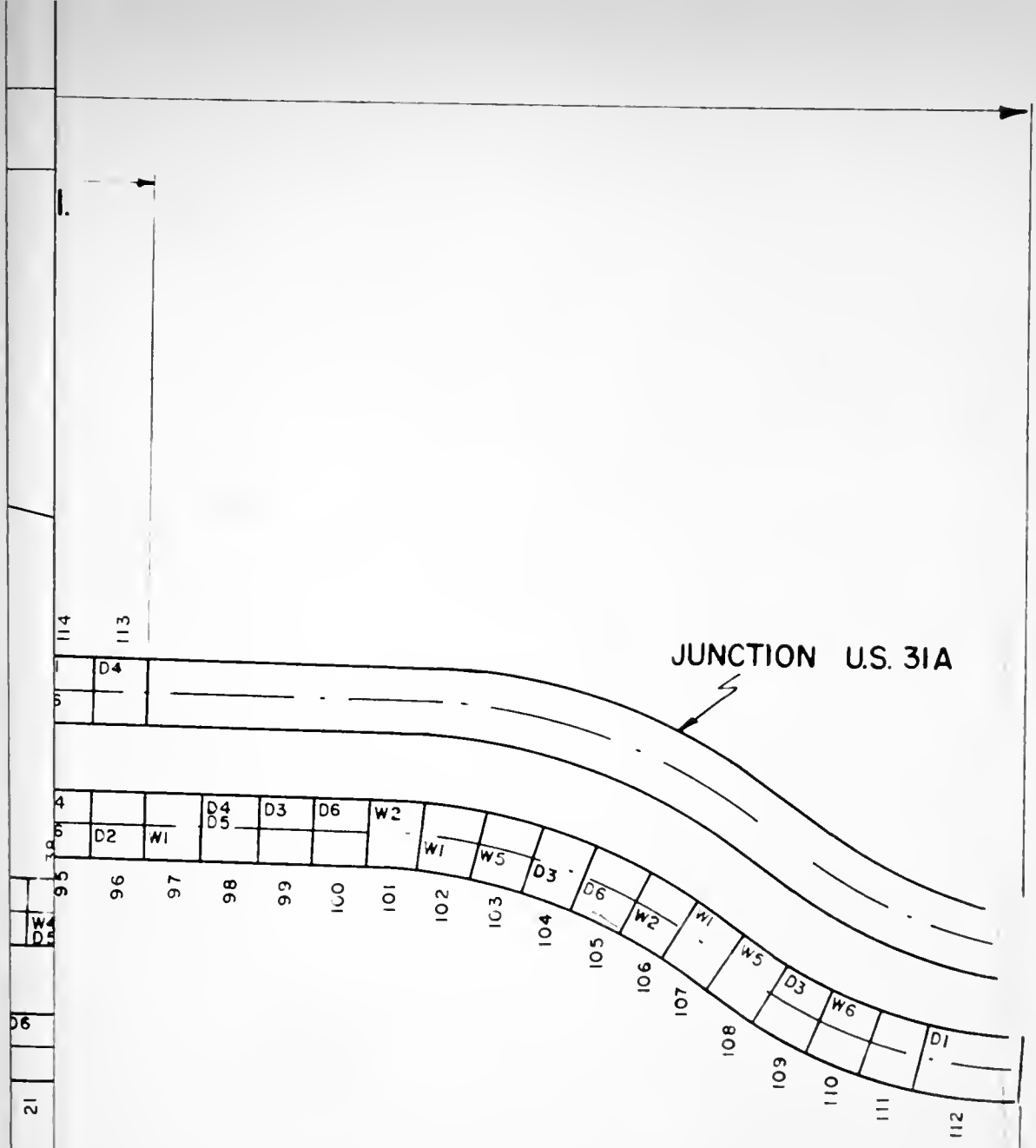
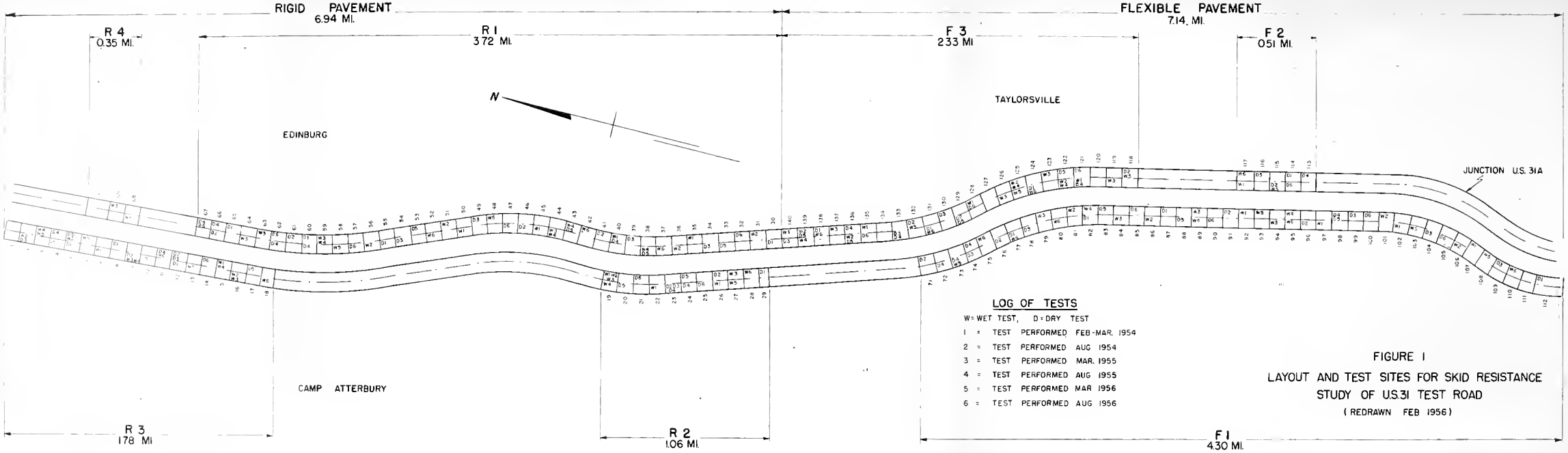



FIGURE 1

)UT AND TEST SITES FOR SKID RESISTANCE STUDY OF U.S.31 TEST ROAD

( REDRAWN FEB. 1956 )




LOG OF TESTS

W= WET TEST, D= DRY TEST

1 = TEST PERFORMED FEB-MAR. 1954
2 = TEST PERFORMED AUG 1954
3 = TEST PERFORMED MAR. 1955
4 = TEST PERFORMED AUG 1955
5 = TEST PERFORMED MAR 1956
6 = TEST PERFORMED AUG 1956

FIGURE 1

LAYOUT AND TEST SITES FOR SKID RESISTANCE STUDY OF U.S.31 TEST ROAD

( REDRAWN FEB 1956)

PROCEDURE

As planned, skid tests are being performed twice a year, once during the winter and once during the summer. The winter tests are conducted in February or March and the summer tests in July or August on days that weather will permit. Tests have now been performed in February and March, 1954; August, 1954; March, 1955; August, 1955; March, 1956, and August 1956.

The skid equipment which was developed in 1954 for a comprehensive skid resistance study of pavement types has been utilized for all tests except those made in February and March, 1954. Since those tests were made with different equipment, the data were adjusted on the basis of comparative tests as reported in Progress Report No. 1, so as to be comparable with subsequent test data.

Each of the two test pavement types are divided into 70 one-tenth mile sections. The sites selected for test series No. 6 are shown in Figure 1 along with all sections tested in the five previous studies. It can be observed that the sites, selected at random, are well distributed over the test road and may be considered as representative of the entire section.

For each semi-annual study to date the following plan has been used as a guide:

1. Skid tests were made at a speed of 30 m.p.h.

2. Skid tests were made under wet and dry conditions. Wet tests were made by artificially wetting the pavement until water would stand on the surface.

3. An equal number of skid tests were made on each pavement type.

4. An equal number of skid tests were made in each traffic lane and for each direction of traffic flow.

5. Sixteen cubes were selected, three to be wet and six to be flooded to the edge. These cubes were marked in a manner that gave each one tenth mile section an equal opportunity of getting into the sample, but the established policies established in items 3 and 4 above.

6. Two grade measurements were made at each site.

7. The mean stopping distance for each test and dry was determined for each of the surface types along with the range, or variation in stopping distance, for each given surface.

8. Temperature was recorded several times during the progress.

Summary of Results for Test Series No. 3

Each of the following values represents the average of eight tests, namely, two runs on each of the test sections in both directions of traffic.

Total Stopping Distance in Feet for 40 MPH Initial Speed

| | Dry Tests | Wet Tests |
|---|---|---|
| Flexible Pavements | | |
| Inner Lane | 99.9 | 91.5 |
| Outer Lane | 90.1 | 110.9 |
| Rigid Pavements | | |
| Inner Lane | 91.7 | 77.7 |
| Outer Lane | 91.4 | 103.2 |

As is generally the case in a study of this nature, the results of the dry skid tests were not particularly significant. The stopping distances on the flexible pavement averaged about a foot shorter than for the rigid pavement, but considering the variation in test results this was not significant.

In considering the results of the wet skid tests however,

[illegible] the two surface types [illegible] the effect of the traffic lane [illegible] surface type. It required a 23% g[illegible] the outer lane of the rigid pavement th[illegible] the flexible pavement this increase in stopping distance in the outer lane amounted to about 21%.

In comparing [illegible] surface types the rigid pavement [illegible] characteristics of the two. The mean stopping distance on the flexible pavement was 3% greater than for the rigid pavement in the inner lane, but only 7% greater in the outer lane. From this comparison it would seem that any "polishing" or wear effect would be more severe in the outer lane, so that any difference between surface types would be more pronounced in this lane. Further discussion of lane effects will appear in a subsequent section.

## Discussion of Stopping Distance Trends for the Six Series of Tests

In discussing the stopping distance trends which have developed during the six series of tests covering a 2 1/2 year period reference will be made to the summary of data in Table 1, where each value represents the mean stopping distance for four skids, and to the curves of Figure 2, where each plotted point represents the mean value for eight skids. In Figure 2 the brackets shown for each of the plotted points on test series No. 6 indicate the variation in stopping distances that existed between the four "similar" sections for which the mean value was computed.

oil drippings, dust and rubber from tires so that when the surface is sprinkled in preparatory to skidding this debris is flushed up and serves as an additional lubricant, giving much lower resistance values.

Although Indiana does not experience the extreme seasonal variation of California, this phenomena is still present to a limited extent. Test series No. 5 was performed soon after a prolonged rainy spell, which had left the test sections in a "scrubbed" condition. Test series No. 6 was run during a relatively dry spell, and the surface did have an accumulation of foreign matter. This, coupled with the fact that the same set of tires was used in both cases and for test Series No. 6 was beginning to show evidence of wear, may explain in part the apparent loss in skidding resistance of as much as 20%, which occurred in a period of less than six months between test series No. 5 and 6.

One other possible trend that appeared for the first time in test series No. 6 was that for the wet tests in the outer lane, better skidding resistance was developed in the southbound direction than in the northbound. For the flexible pavement the mean stopping distance was 10.4 feet less in the southbound direction, and for the rigid pavement 4.7 feet less. Direction was not significant, however, for wet tests on inner lanes or for any of the dry tests.

SUMMARY AND CONCLUSIONS BASED ON THE SIX TEST SERIES

1. For the dry skid tests there is no significant difference between the rigid and flexible pavements between the inner and outer lanes or between the directions of traffic.

2. For wet skid tests the rigid pavement has consistently exhibited better skidding resistance than the flexible. For test series No. 6 this advantage amounted to about 9 feet in the outer lane and 14 feet in the inner lane.

3. The flexible pavement shows a wider variation in wet skid resistance than the rigid. The maximum stopping distance for the flexible pavement exceed the mean by over 13 feet, while for the rigid pave this value was less than 7 feet.

4. Under wet conditions the stopping distance in the outer traffic lane is greater than for the passing lane. For the flexible pave ment the difference in length of skid for the two lanes averaged 19 feet, and for the rigid pavement 26 feet.

5. With the exception of the fifth series of tests run in March, 1956, the test surfaces have exhibited progressively poorer skidding resistance due to the effect of time and traffic. For both the rigid and flexible pavements the average stopping distance in the outer lane has increased over 50% during the 2 1/2 years of testing.

6. For test series No. 6 the wet skidding resistance in the outer lane for both the rigid and flexible pavement is significantly greater for southbound traffic than for northbound.

FIGURE 2 – STOPPING DISTANCE TRENDS ON U.S. 31 TEST ROAD

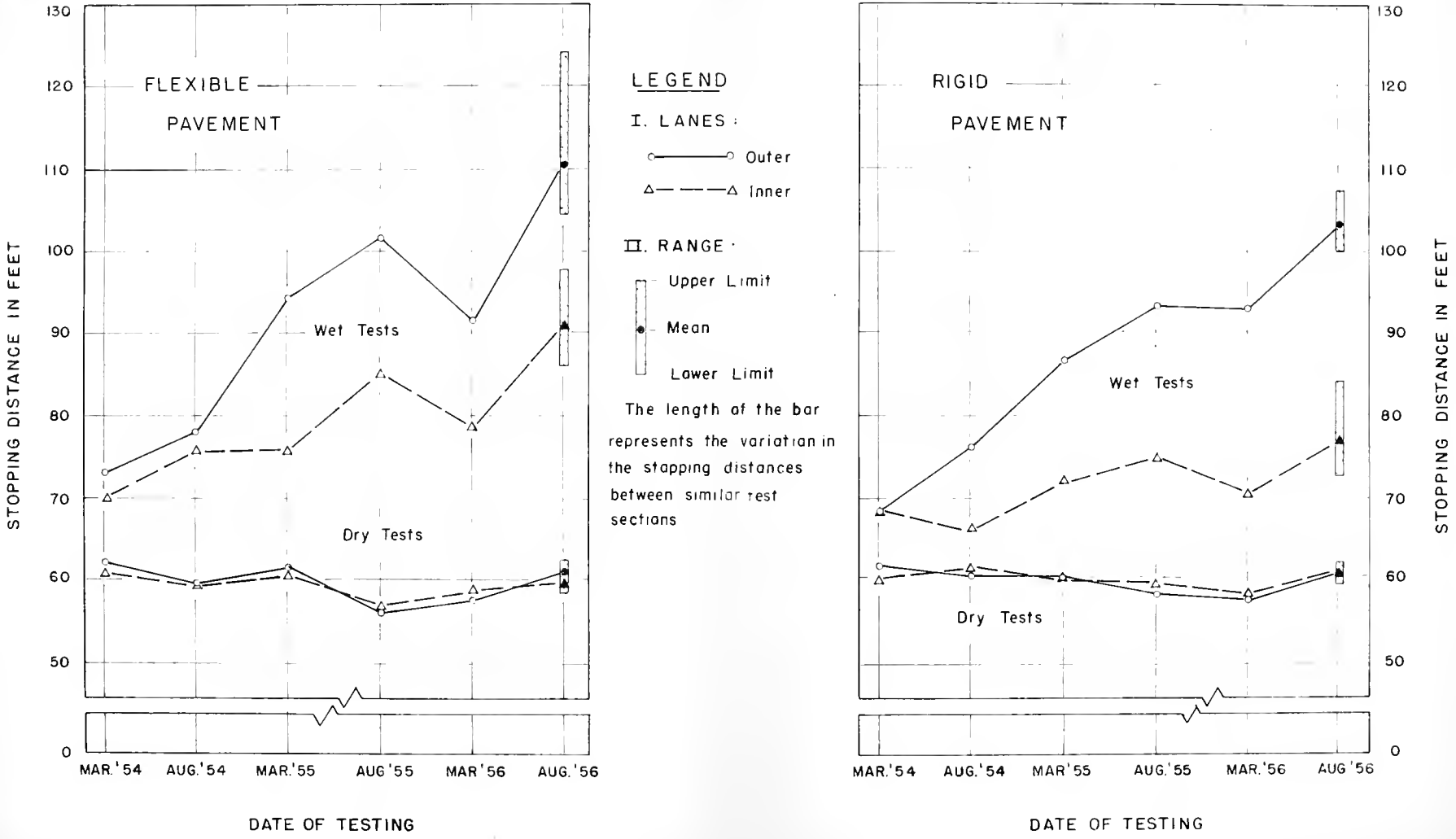


TABLE [illegible]

Mean [illegible]

| Surface Type | Condition | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | Aug. 56 |
|---|---|---|---|---|---|---|---|---|
| Flexible | Wet | Inner | South | | | | | 91.7 |
| | | | North | | | | | 91.3 |
| | | | Average | | | | | 91.5 |
| Flexible | Wet | Outer | South | | | | | 116.8 |
| | | | North | | | | | 115.0 |
| | | | Average | | | | | 115.9 |
| Rigid | Wet | Inner | South | | | | | 93.8 |
| | | | North | | | | | 91.6 |
| | | | Average | | | | | 92.7 |
| Rigid | Wet | Outer | South | | | | | 106.8 |
| | | | North | | | | | 105.5 |
| | | | Average | | | | | 106.2 |
| Flexible | Dry | Inner | South | | | | | 1.6 |
| | | | North | | | | | 1.3 |
| | | | Average | | | | | 1.9 |
| Flexible | Dry | Outer | South | | | | | 1.7 |
| | | | North | | | | | 2.2 |
| | | | Average | | | | | 1.0 |
| Rigid | Dry | Inner | South | | | | | 1.7 |
| | | | North | | | | | 1.7 |
| | | | Average | | | | | 1.7 |
| Rigid | Dry | Outer | South | | | | | 1.7 |
| | | | North | | | | | 1.3 |
| | | | Average | | | | | 1.0 |

Each value represents the average of [illegible] test sections